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AUTHOR Walter, Gerard; And Others
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ABSTRACT

This study compared two methods of English instruction for adult deaf students: a computer assisted instructional treatment, and a normal classroom environment. The results indicate that no significant difference in learning occurred between the two treatments, based on the reading and writing skills achieved by students during an instructional series at the National Technical Institute for the Deaf. The lack of clear results may have been caused by specific difficulties in the design of the experiment. These design problems and implications for future research are discussed. (Author/STS)

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The Evaluation of a Computer Assisted Instruction Drill Program For Increasing Language Skills of Young Deaf Adults

Gerard Walter

James vonFeldt

Kathleen Crandall

December, 1975

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National Technical Institute for the Deaf

Rochester Institute of Technology

Rochester, New York 14623

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The Evaluation of a Computer Assisted Instruction Drill Program

For Increasing Language Skills of Young Deaf Adults

I. INTRODUCTION

The handicapping effects of pre-lingual deafness are reflected most in the ability of deaf persons to master the native language used by hearing people around them. Research has demonstrated that the structure of language is internalized by hearing children by the ages of five to seven years (McCarthy, 1953; Carroll, 1960; McNiell, 1970; Brown, 1973). Deaf children, on the other hand, are still struggling with the elementary structures of the language well into the adolescent years -- many probably never become proficient with the syntax and semantics of the language (Cooper and Rosenstein, 1966; Moores, 1967; Quigley and Power, 1972; Carrow and Fletcher, 1974). This language retardation of deaf students affects their ability to compete successfully with their hearing peers in a complex educational experience such as NTID/RIT.

While NTID students are probably somewhat higher in general achievement level than the average deaf person graduating from programs for the deaf, they still exhibit a profound retardation in general linguistic capabilities as measured by standardized tests (Walter, 1974). Table 1 provides the distribution of scores for students entering NTID in 1974 on the vocabulary part of the California Reading Test (Tiegs and Clark, 1963). Table 2 provides similar results for the comprehension part of the California Reading Test.

Insert Tables 1 and 2

As can be seen from these tables, entering NTID students represent a heterogeneous population with a mean grade equivalent for vocabulary at 7.3 and for reading comprehension at 8.2. These levels are far below the levels of hearing students entering junior colleges.

Results of the sentence subtest of the Comparative Guidance and Placement Program (CEEB, 1972) indicate the level of NTID students' mastery of the rules and constraints of standard written English. Table 3 demonstrates that entering NTID students are far below the abilities of their hearing peers (at about the 10th percentile for entering junior college students).

Insert Table 3

While a standardized test of the mechanics of written language gives some insight to the ability of the student to understand the rules of the language, it provides little by way of rating the ability of the student to express himself in writing. For this reason, NTID has developed the NTID Written Language Test. The test consists of an extended written exercise in response to a short film (Sims, 1970). Students are asked to write a composition which is graded for intelligibility on a scale from 1 to 5.[1] Table 4 provides the distribution of student scores on the NTID Written Language Test. As can be seen,

[1]Details of the scoring criteria can be obtained from the National Technical Institute for the Deaf, Department of English, One Lomb Memorial Drive, Rochester, New York 14623.

the majority of entering NTID students exhibit considerable difficulty in writing acceptable English.

Insert Table 4

The low scores on these tests are in agreement with previous findings concerning the linguistic abilities of deaf students (Cooper and Rosenstein, 1966). NTID, however, has a mandate "to develop and evaluate new imaginative instructional technology for application in the education of deaf students." (NTID, 1967, p. 6)

Applications of instructional technology to the language area have been sparse, especially in the area of special education dealing with deaf people. A search of the literature has indicated only two controlled studies using deaf subjects that relate directly to techniques of instruction in language for deaf students (Stuckless and Birch, 1964; Bornstein, Stokoe, Greenberg, 1968). Yet, it is in the area of language instruction where the greatest need for research exists.

The rules of language are learned through repetition and immediate feedback concerning the appropriateness of the response. As such, the computer would seem to be a logical tool to use in providing the kind of individual attention and immediate feedback needed for language learning. Barnes and Finkelstein (1971) have pointed out this fact when they note "...It is the speed and memory characteristics of computers which offer the learner the individual attention so obviously missing from our education system." (p. 466)

As was pointed out above, little research data exists concerning the utilization of computer technology in teaching language to deaf students. Areas that are most often reported are those dealing directly with mathematics learning of deaf students through use of the computer. Barnes and Finkelstein (1971) describe a system for providing NTID students the necessary methodological skills in order to successfully complete a beginning calculus course at the Rochester Institute of Technology. However, no evaluation data concerning this system is reported.

Various quasi-empirical reports appear in the literature concerning the use of the Computer Curriculum Corporation[2] materials at the elementary levels. Douglas (1971) indicates that students seem to have been learning more in less time than under the usual teaching methods. However no controlled study was underway at the time the Douglas paper was published. Behrens and Provence (1971) reported on the use of the Computer Curriculum Corporation (CCC) language materials at the Kendall School for the Deaf. They indicate that the program has served as an impetus to the teachers in their planning and as a tool to the students in getting immediate feedback and reinforcement in their work. Culbertson (1974) reported on the success of the use of the Computer Curriculum Corporation mathematics programs in Texas and indicated significant gains in mathematics achievement for deaf students. The report also indicates that the elementary language arts program was under consideration for use in Texas. Fletcher and Beard (1973) report on the evaluation of a CAI language arts program for use with deaf students. This

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[2]Computer Curriculum Corporation is an Educational Software company with offices at 1032 Elwell Court, Suite 106; Palo Alto, California 94303.

report describes the development of the CCC system and programs. However, it only stresses the variation and intensity of experimental treatment rather than a comparison of experimental and control groups. This is a basic weakness of the study since no "outside criteria" concerning the effectiveness of the program seems to have been utilized in evaluating the success of the curriculum. This lack seems to exist in most evaluations of CAI materials.

Smith, von Feldt, and Subtelny (1974) have described a program designed to teach vocabulary and diacritical markings of technical words. The report indicates that CAI is more effective for teaching vocabulary than the diacritical markings of the words. Fletcher and Suppes (1973) report on the use of CAI for mathematics and language arts with up to 2,000 deaf students during the years 1971 to 1973. Generally, the results of the study show that the program had success as an instructional tool in the mathematics area but no data is presented concerning its success in improving language skills of deaf students.

In summary, with the exception of the work at Stanford University, little application has been made of the computer to assist in attacking the ever-present language problems of deaf students. The studies that have been attempted do not seem to present any conclusive results.

With the language difficulties of NTID students in mind and the potential of computer assisted instruction as a tool for remediation, von Feldt, Subtelny and Crandall (1974) proposed the installation, on an experimental basis, of the Adult Reading Skills, the Adult Language Skills I, and the Adult Language Skills II programs of the Computer Curriculum Corporation, Palo Alto, California.

According to the proposal, the purpose of the study was to:

> Test the validity of computer assisted instruction in improving reading and English language skills of NTID students through the use of the Adult Reading and Language Skills Programs developed by the Computer Curriculum Corporation as a controlled supplement to the NTID English curriculum. (p. 5)

The objectives of this study are to:

1. Establish student achievement gains in reading and language skills;

2. Compare student achievement gains and time required (computer group vs. control group);

3. Compare the gain scores in time use between high, middle, and low entrance levels by computer group and control group;

4. Compare the cost per unit of gain for both the computer and control groups. (von Feldt, Subtelny, Crandall, 1974, p. 6)

As such, the proposal was accepted with the modification that an experiment be conducted where the experimental group would take only the Computer Curriculum Corporation materials and the control group only the standard NTID English program. This was done in order that the ordinary classroom instruction could be compared directly with the computer assisted instruction approach. This modification is based on the philosophy that NTID should seek to install only those techniques which can improve upon currently employed methods of instruction.

The purpose of this paper, then, is to report on the results of the experiment using the Computer Curriculum Corporation materials with students at the National Technical Institute for the Deaf.

The following hypotheses have been tested through the research design of this study.

1. There is no significant difference between the experimental and control group for vocabulary as measured by the vocabulary section of the California Reading Test.

2. There is no significant difference between the experimental and control group for reading comprehension as measured by the comprehension section of the California Reading Test.

3. There is no significant difference between the experimental and control group for comprehension of material -- directly stated facts -- as measured by the California Reading Test.

4. There is no significant difference between the experimental and control group for interpretation of material -- inferences -- as measured by the California Reading Test.

5. There is no significant difference between the experimental and control group ratings on grammatical correctness of written compositions.

6. There is no significant difference between the experimental and control group in vocabulary usage in written language as measured by the type token ratio.

7. There is no significant difference between the experimental and control group in sentence complexity as measured by the ratio of number of propositions per ten sentences.

While these are the major hypotheses that were tested in this study, it should be pointed out that there are a series of questions which are outside the scope of this paper, but which should be included in any complete study of new educational systems. Questions concerning the amount of time related to educational activities, the cost of material and space utilization, the comparison of the various teaching techniques through some statistical approach, and other such technological questions related to the use of media are examples. While these questions are not directly addressed in this study, the discussion section of this paper will attempt to integrate them into the report.

II. METHOD

Subjects. The subjects for this study consisted of two groups of fifty students each chosen at random from students entering NTID during the summer of 1974. One group was assigned to the Computer Curriculum Corporation materials in lieu of regular English course offerings. The second group was assigned to regular class placement using the standard NTID English Department criteria for class placement (see Table 7). Table 5 summarizes the characteristics of the two groups from data collected within the first two weeks of attendance at NTID.

Insert Table 5

As can be seen from this table there was no significant difference between the two groups for any of the variables except the California Vocabulary Test. The cause for this difference could not be determined in light of the consistant results on the other measures. The difference could be due to chance factor alone. It can be concluded that the groups are essentially equated with regard to those variables.

Treatments. As is stated above, this study was designed to compare the treatment by use of Computer Curriculum Corporation materials with the treatment as reflected in "ordinary" English class placement. It is essential the reader realize that control of factors such as teacher compatibility, classroom materials, laboratory experience for the "ordinary" group, etc., was not attempted.

As is the case in any educational, action-type research, complete control of all the variables is impossible. Control of treatment

for the "average" classroom group was impossible in this study. However, explication of summaries of the two treatments should permit the reader to better understand the types of exposure to English both groups had during the period of the experiment.

Computer Curriculum Corporation. The Computer Curriculum Corporation Adult Language Skills and Adult Reading Skills programs are structured around the concept of a strand. A strand is defined as a group of related items arranged in an ascending order of difficulty. A program, then, is made up of a group of strands, each emphasizing some element of the total curriculum. The Adult Language Skills programs have nine strands and cover the topical areas listed in Table 6.

Insert Table 6

In a similar way the Adult Reading Skills program has five strands covering the topical areas also described in Table 6 under Reading. Both programs function basically on the multiple choice format which requires the student to type the best answer from a given set of possible choices. Examples of the task are provided below.[3]

ABBIE _____ ALL OF HER HAIR INSIDE THE SMALL CAP.

PUT PUTTED

[3]Additional examples are contained in Appendix A. Detailed information concerning the program can be obtained by writing Computer Curriculum Corporation, 1032 Elwell Court, Suite 106; Palo Alto, California 94303.

SEVERAL OF THE _____ PAGES WERE MISSING.

BOOKS' BOOKS

THIS BEAUTIFUL RANGE WILL MAKE COOKING FUN.

THIS IS _____.

1. An opinion 2. A fact.

Generally, the programs begin with simple materials and move to more difficult levels, treating samples of items from each strand in turn. If a student provides a wrong answer for an item, it will be presented to him later in the program. The program also keeps statistics concerning the progress of the student through the program. See Appendix A for more detailed information concerning the record-keeping capabilities of the system.

In addition to the Adult Language and Reading Skills programs, NTID students made use of an additional program -- the GED curriculum. The purpose of this set of programs is to prepare students to take the GED High School Equivalence Examination. While this program was not of primary interest in this study, students were permitted to use the GED materials after finishing the language and reading portions of the program. Since the study lasted only two quarters, no NTID student finished this program by the end of the study. The function of the course is much the same as described earlier, except that students are required to read a great deal more than in the other programs. The GED curriculum has seven parts:

Introductory Lessons
GED English
GED Social Science
GED Natural Science
GED Literature
GED Mathematics
Preparatory Lesson

More detailed information concerning the GED curriculum is contained in Appendix A.

In summary, the students taking the Computer Curriculum Corporation materials entered the program at the low level of the Adult Language and Adult Reading programs. After completing these programs, they proceeded for the remainder of the experimental time into the GED curriculum. In all, 50 students began as part of the study and 48 completed the two quarters of the program.

NTID English Curriculum. Student program placement within the English Department is tied directly to student performance evaluation and diagnosis. In order to achieve this goal, the NTID English curriculum is divided into five levels. Table 7 presents the five levels with accompanying performance specification for placement in each level. It has been found that few students vary more than one level across the skill areas. This is not surprising if one considers that language-related skills are generally highly intercorrelated.

Insert Table 7

The performance evaluation permits placement of students in order that they will receive homogenous treatment aimed at moving their skills to that of the next level. The curriculum at the 1, 2, and 3 levels stresess basic syntactic structure, vocabulary development and composition

skills; while at the 4 and 5 levels emphasis is placed upon preparation for higher level technical and liberal arts courses. Table 8 provides more detail concerning the objectives and course content for each of the levels.

Insert Table 8

After testing, students are placed in their appropriate level as per the criteria contained in Table 7. Table 9 provides a breakdown of the subjects in this study into the various levels of the curriculum. For the sake of comparison the distribution of students in the Computer Curriculum Corporation group is the same as that in the control group. As can be seen, both groups distribute across the levels in approximately the same way.

Insert Table 9

Data Collection and Analysis. The basic data analysis for this study consisted of pretest-posttest measurements of the subjects using two tests: the California Reading Test, vocabulary and comprehension sections (Tiegs and Clark, 1963) and the NTID Written Language Test. The pretest data were collected for all entering NTID students in July of 1974 with the posttest data being collected in December, 1974 and again in March, 1975. Thus there were two sets of posttest scores at the end of each academic quarter during which the study was in progress. The basic form of analysis carried out for this study is a test of significance between the amount of gain achieved on the above tests (and parts thereof) for the two groups.

In addition to the basic analyses, descriptive data covering the amounts of time on learning will be presented as an aid in determining the efficiency of the various learning procedures.

The tests will be evaluated in different ways in order to describe a range of different skills that might relate to selected hypotheses of the study.

III. RESULTS

The format for this chapter will be to present data in tabular form as they relate directly to the hypotheses specified in the first chapter. It is hoped that in this way the reader will be provided a better grasp of the relationship between the results and the specified objectives of the study.

Hypothesis 1.

> There is no significant difference between the experimental and control group for vocabulary as measured by the vocabulary section of the California Reading Test.

Table 10 presents the results comparing the experimental and control group for the vocabulary section of the California Reading Test. It can be seen from this table that while the computer assisted instruction group was significantly better in vocabulary at the beginning of the experiment, their gains were not of the magnitude of the regular English class. The increased gain in magnitude for the regular English class has reduced the difference between the groups by the end of the study time to a non-significant difference. The regular English class had an average gain of .69 while the computer assisted instruction group had an average gain of .46. Looking at the data from a slightly different perspective, the question can be asked whether or not the amount of gain for each group is significant. A paired comparison t-test for each group between the summer scores and the winter posttest scores yielded significant t-values for each group. This indicates that the amount of gain for each group was greater than chance with the regular English

class gaining more than the computer assisted instruction group. Table 10 summarizes this information.

Insert Table 10

Hypothesis 2.

> There is no significant difference between the experimental and control group in reading comprehension as measured by the comprehension section of the California Reading Test.

Table 11 contains data relating to the results of the California Reading Test, the comprehension section. As can be seen from this table there were no significant differences between the groups on either the pretest or the posttest. However, the regular English class gained more than the computer assisted instruction group. For both groups, the amount of gain is significant when a paired comparison is made between the summer scores and the winter scores. The amount of gain for each group is highly significant. This data is presented in Table 11. Again, the control group gained more than the experimental group.

Insert Table 11

Hypothesis 3.

> There is no significant difference between the experimental and control groups for comprehension of material -- directly stated facts -- as measured by the California Reading Test.

In order to more fully understand the meaning of the data concerning reading comprehension, a facility to specify questions that relate to factual recall was used in order to determine amount of gain in this area. Table 12 provides data relating to the number of questions a student answered correctly concerning factual recall of information. It

should be noted, at this point, that these scores are in raw score units, and not in grade equivalent units as previously described. Careful attention must be paid to the range of questions provided in the table. It is interesting that there is no significant difference between the groups on the scores on the pretest or posttest. However, when the amount of gain is compared, the regular English class gained consistently more than the computer assisted instruction group. However, paired t-tests for the significance of the difference between the gains was not significant in either group. These data are summarized in Table 12.

Insert Table 12

Hypothesis 4.

There is no significant difference between the experimental and control groups for interpretation of material -- inferences -- as measured by the California Reading Test.

Table 13 is analogous to the data presented in Table 12 but this time the data are presented in terms of those questions dealing with inference about the reading material. There are no significant differences along any of the dimensions of the pretests or posttests when both groups are directly compared, and no difference within groups on the pretest-posttest measures when paired t-tests are presented. In relation to inferences the difference is very small. The control group gaining about .39 of a raw score unit and the experimental group gaining approximately .44 of a raw score unit. These amounts of gain are not significant for the groups.

Insert Table 13

Hypothesis 5.

There is no significant difference between the experimental and control groups in weighting of grammatic correctness of written compositions.

To this point, the data have been primarily concerned with the receptive mode of written language (Reading). Writing was also an important factor in the experimental treatment, and for this reason the grammatic correctness of a student's written composition has been evaluated. Written compositions of the students were scored according to rules developed by the NTID English department. Table 14 provides a summary of the rules for rating written compositions of students at NTID. This rating scale is based on a five point system with a "5" indicating a composition free of semantical and syntactical anomolies, and a "1" a composition that is unintelligible to the reader. Each of the first 10 sentences in students' compositions are scored in this manner. The sentence scores are then averaged to obtain a written language score. The results are presented in Table 15. From Table 15 it is apparent that no significant gains exist between the experimental and control groups in the area of writing skills. While both groups seem to have gained in their writing skills, these differences are not significant either within groups or between groups.

Insert Tables 14-15

Hypothesis 6.

There is no significant difference between the experimental and control groups in vocabulary usage in written language as measured by the type token ratio.

As with the reading aspects of the tests, it was deemed important to further analyze the nature of the compositions written by deaf students. One aspect of measuring written compositions is to look at the vocabulary used in written compositions. For this purpose the type-token ratio was chosen to examine the frequency of use of different words in the written compositions. For the purpose of this study, type-token ratio is defined as the ratio of the number of different words used in a composition per fifty words. As an example, a score of 35 would mean that a student used 35 different words in his composition for the first fifty words.

Table 16 provides the results for the experimental and control groups on measures of the type-token ratio. As can be seen, the results are similar to those presented in the written language, grammatic correctness measure. There are no significant differences between the groups. As a matter of fact, the groups' scores on type-token ratios were slightly poorer on the posttest than they were on the pretest. However, this lower score is not significant.

Insert Table 16

Hypothesis 7.

There is no significant difference between the experimental and control groups in sentence complexity as measured by the ratio of number of propositions per ten sentences.

Another aspect of language analysis would be to consider the numbers of main verb phrases attempted by NTID students per sentence (Bellugi and Fisher, 1963). In order to accomplish this the number of main verb phrases per ten sentences were counted and the ratio of the number

of main verb phrases to ten sentences was calculated. As can be seen from Table 17, there is no significant difference within groups or between groups on this measure of language complexity. It is interesting, again, that on the posttest the students did poorer than they did on the pretest. This is the same tendency that was noted in the results of the type-token ratio measurements. While this difference is not significant it could be that the stimulus used for the study did not yield the quality of language as the stimulus used on the pretest for the writing sample. A study currently underway (Crandall, 1975) indicates that there is no significant difference between the forms and the quality of language produced by the students. This lower count for propositions, coupled with the lower type-token ratio on the post test, may be the result of an attempt on the part of students to control their language by reducing the structional complexity of their sentences and using fewer difficult words.

Insert Table 17

Time. A final aspect of the results that needs to be presented is the amount of time the two groups took to complete the various treatments. While this data is not directly comparable, it can be stated at this point that the average amount of hours for students in the experimental group to complete the study (the reading and language sections) was 13.73 hours as compared to the control group who took approximately 50 hours of class and instructor time per quarter to complete their material. A statistical comparison of these two times is meaningless since the amount of information presented and the type of curriculum is not controlled nor is the exact specification of the criterion elements.

The question that needs to be asked is whether or not any differences would occur if the same content was presented in both treatments. This is a question which needs to be answered before any controlled analysis of time can be performed.

IV. DISCUSSION OF THE RESULTS

Language Learning

From the data presented in the previous chapter, it becomes quite clear that while both treatments provided for some significant gains within their groups, neither treatment surpassed the other in terms of amount of gain. However, one may say that since the amount of time it took the CAI group to achieve their scores was considerably less than that consumed by the experimental group, then the CAI method should be the one that is implemented. Caution needs to be exercised at this point. From the data collected in this study it is not at all clear what caused the gains in either group. The hypothesis could be made that exposure to the environment at the National Technical Institute for the Deaf would alone account for the gains that occur in students' language skills. By the same token, the instruments used in measuring the gains may not at all be appropriate for specifying the types of things accomplished within either of the treatments. By all internal criteria measures, the students who performed on the items within the CAI group answered most questions in the system correctly. Also, by looking at the scores on tests given by professors, students in the control group tend to score better than 75% on in-class tests. Yet, the design of this study has not controlled for varying objectives and methodologies within treatments. The point to be made is that while there are significant gains, we should not jump to the conclusion that the gains are necessarily the result of instruction that has taken place. This conclusion holds for both groups.

It is important to point out that, historically, NTID students have gained approximately a two-thirds grade equivalent per year during their previous school years in language skills. If the average reading score at entry --7.9--is represented in gain per year amounts, then in 12 years of previous education, the student has made a 0.67 grade point gain per year. The students involved in this study gained more than this amount within a twenty-two week time frame. This is an important point if we are interested in acceleration of learning.

As was indicated in the introduction to the paper, this was primarily an evaluation study. As such, it is felt that discussion of the process of choosing the CAI program should be taken into account. It is this writer's opinion that the literature concerning the program was not adequately reviewed prior to the procurement of this system. The literature does not indicate that the program had been successfully used with postsecondary level deaf students. The proposal for implementation of the program (von Feldt, et al, 1974) provides no discussion of the cause and nature of language difficulties in deaf students. If no hard data or even a theoretical position relating to language processing of the deaf is discussed, how could a decision to procure a program be made? This lack of planning has resulted in a situation where there exists little relationship between the techniques of instruction used by the program and the curricular objectives of English for deaf students at NTID.

A pilot study (Bochner, 1975) has shown that deaf students can learn the techniques of response in English related exercises but still not display functional improvement in skills after about one hour of instruction. Such may have been the case in this study. While all deaf students completed the CAI program, we feel that this has not resulted in learning the English language. Exploration of reading and writing abilities of the students would indeed indicate the fact that they learned only the mode of response and not functional English skills. The English language is not a simple series of rules that a person must memorize, but a set of intuitive understandings that relate semantics, syntax, phraseology, and the experiential realm of the learner. Unlike the hearing person who intuitively uses the rules of his language and need only associate a stated rule with an already functioning system, the deaf individual probably does not understand (intuitively) the language. We cannot impose labels on an existing system, but must seek to build the system itself. Unless an instructional program has the capability of expanding or contracting to meet the needs of a student at a given instance in a specific English area, then it probably cannot achieve the objectives of teaching English to deaf students. It might be noted that there is no clear reason to expect that a classroom teacher can do this. However, within the classroom environment, under the current restraints of technology, the teacher provides a potentially infinite set of bounds within which the language can vary. The program under consideration here, on the other hand, is strictly limited to what it can present the student and to the type of language response the student can make. Its content and application is finite. Language

growth is a generative process and does not develop by responding to multiple choice questions.

In summary, it cannot be assumed that deaf students have a hearing knowledge of English and need only to learn how to order what they hear in a written form or to transpose the written form into meaning from the printed page. The problems posed to English instruction by deafness are much more basic. Deaf students do not have the intuitive understanding of the language as do most hearing children at four or five. For this reason the basic fundamental relationships of the language need to be taught, and not the correct use of already functioning rules. The fact that the CCC system uses English itself to present directions, to ask questions, and to accept answers from the student presupposes a certain fundamental level of English which cannot be assumed on the part of the deaf student. The results of this study would support the idea that a detailed analysis of the problem must be made before any treatment can be designed to remediate the language problems of deaf students with a high success rate.

Experimental Design Problems

It was indicated earlier that specific difficulties in the design of the experiment may have led to the fact that no clear results have been demonstrated. There are many questions still remaining that need to be asked concerning ways of comparing treatment effects. We know little about how to compare the effects of the treatment of a specific teacher in the classroom with the effects of treatment of self-instructional materials. How do we know the content of one treatment is significantly different from the content of another treatment? How do

we know that the presentation of a vocabulary unit by a teacher in a teacher-made method is significantly different from the same set of vocabulary items presented in a CAI mode of instruction? To date, we know of no objective way in which this type of comparison can be made, yet the question needs to be addressed if one is to look at the real effects of treatment on criteria measures. There is no way to be sure that the contents are indeed different (or the same) and how they are different (or the same). This same set of questions needs to be asked concerning the treatment conditions themselves. Techniques and instruments need to be developed that allow scaling of contents and treatments of specific media and treatment conditions. It would seem that improved evaluative instrumentation must be developed in the near future in order that definitive evaluation can occur. We cannot rely on such dummy variables as gain scores or time on task to show the effectiveness of media. This author would guess that such criteria will continue to be unsuccessful in showing the impact of media because they only grossly approach what is really being taught in the classroom or the strategies used in the educational setting.

Implications

The implications from this study are probably more general than they are specific to the CAI technique being evaluated in this report.

1. Documentation concerning a specific media's fit with curricular area must be provided.

2. A detailed design for an experiment should be worked out well in advance of the inception of the study. Such design must take into account all factors for which the program is supposed to be instructing.

3. Instrumentation relating to evaluation of education must be developed. These instruments must include techniques for quantitatively describing the content of a course, the strategies of a course, and the objectives of a course. Until such quantitative measures are available, any evaluation based on outside criteria will probably not be valid since there is no way of knowing whether the objectives of two or more treatments were the same or different.

4. Language instruction is not a simplistic mechanical function that can be taught to deaf students in ways that have been shown in the past not to be successful. Future emphasis must be on the intuitive aspects of a language, rather than on specification of rules. The CCC language programs provide for no increased language development of deaf students that improves upon current practices.

V. SUMMARY

The purpose of this study was to compare two methods of English instruction: one, a computer assisted instruction treatment, the other a normal classroom environment. The results of the study have indicated that there is no significant difference between the two treatments based on the amounts of reading and writing skills the students achieved during a two-quarter instructional series at the National Technical Institute for the Deaf. Results indicate that while one group achieved no more than the other group, there is no way of indicating specifically which of the techniques are more valid because there is no way of adequately documenting whether the objectives of the two programs are indeed the same or different, or whether the treatments that occur within the classroom and the CAI group are indeed different. Variables that relate to treatment in English are the amount of English used by the teacher and student, level of English structures used by the teacher and student, level of vocabulary used by the teacher and student. It has been recommended from the results of this study that research be undertaken to develop adequate instrumentation to quantitatively describe objectives, strategies, and content of various courses being offered at the National Technical Institute for the Deaf. Until such research is completed, there seems to be little hope of adequately providing good evaluation of instructional strategies at the National Technical Institute for the Deaf.

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APPENDIX A

COMPUTER CURRICULUM CORPORATION • 1032 ELWELL COURT, SUITE 106 • PALO ALTO, CALIFORNIA 94303
TELEPHONE (415) 964-1444

ADULT LANGUAGE SKILLS

Adult Language Skills I and II are basic language arts courses for adults. ALS I covers language skills comparable to those taught in the elementary grades. ALS II builds on the base provided by ALS I to progress to more complex material. Although the concepts covered are on an elementary or early secondary school level, the content of both courses is oriented towards topics of interest to adults.

The courses concentrate on standard English usage. They include punctuation and capitalization. Both courses can be used independently or in conjunction with most language arts texts. Special care has been taken to minimize conflicts between course material and grammatical terminology with which the students may not be familiar.

Although the material covered by the two courses is different, the structure of both courses is the same. Each course consists of nine strands (groups of related items arranged in ascending order of difficulty). The nine strands cover the same areas in both courses but at different levels of difficulty for each course.

Strand A - Principal Parts of Verbs
Strand B - Verb Usage
Strand C - Subject-Verb Agreement
Strand D - Pronoun Usage
Strand E - Contractions, Possessives, and Negatives
Strand F - Modifiers
Strand G - Sentence Structure
Strand H - Mechanics
Strand T - Topics (a special strand that contains short lessons on the topics covered in the other strands)

A typical lesson is made up of a mixture of problems drawn from Strands A through H plus a short lesson from Strand T.

SAMPLE LESSON

ADULT LANGUAGE SKILLS II

This paragraph and the items that accompany it are from Strand T. The asterisk indicates a correct answer. Four slashes indicate an incorrect answer. The computer types the correct answer after the four slashes.

†DO AND †DOES

†USE "DOES" WITH WORDS THAT NAME ONE THING.

†USE "DO" WITH WORDS THAT NAME MORE THAN ONE THING.

†THE DOG DOES RUN. †THE DOGS DO RUN.

†TYPE DO OR DOES.

*****

†THE CHILDREN ---- NOT EAT LUNCH WITH US.

DO

*

†JASON ---- NOT WORK TODAY.

DO

//// DOES

†DAN'S WIFE ---- NOT TEACH AT THAT SCHOOL.

DOES

*

†THE OLD DISHES ---- NOT HAVE PICTURES ON THEM.

DO

*

†JIM'S COAT ---- HAVE A HOLE IN IT.

DOES

*

The following items are from Strands A - H. Items from these strands are presented in a mixed order. In this sample lesson, the strand each item comes from is shown in parentheses. This information is not displayed to the student.

†ABBIE ---- ALL OF HER HAIR INSIDE THE SMALL CAP. (Strand A)

PUT PUTTED

PUT

*

†PAULINE TALKED ---- SO SHE WOULDN'T WAKE UP THE KIDS. (Strand F)

QUIET QUIETLY

QUIETLY

*

†MILTON ---- THE LATE SHOW EVERY †SATURDAY NIGHT. (Strand C)

WATCH WATCHES

WATCHES

*

†SEVERAL OF THE ---- PAGES WERE MISSING. (Strand H)

BOOK'S BOOKS

BOOKS

//// BOOK'S

†I ---- SITTING ON THE RED CAR IN THAT PICTURE. (Strand B)

BE AM

AM

*

†WHICH IS A SENTENCE? (Strand G)

1. †TO SEE THE MOVIE BETTER.

2. †GAIL SAT UP IN HER SEAT.

2

*

†HE TOLD †LESTER AND ---- ABOUT THE MEETING LAST NIGHT. (Strand D)

SHE HER

SHE

//// HER

†THAT NEW BUILDING DOESN'T HAVE ---- ROOF YET. (Strand E)

A NO

A

*

HOW TO READ THE ADULT LANGUAGE SKILLS PROGRESS REPORTS

The Adult Language Skills progress reports look like this:

ST	A	B	C	D	E	F	G	H	T	LST	TO	COM	TIME	STUDENT
CL	61	42	83	91	70	35	44	78	137	32	1	69	8:04	1
%	61	42	83	91	70	70	59	78	69	94	60			

ST stands for strand (area). This course has 9 strands.

CL stands for class (group of 5 questions). The class number shows how many classes in each strand have been completed.

% the percentage of each strand completed

LST The top number shows the number of questions answered during the last session. The bottom number shows the percentage answered correctly.

TO The top number shows how many times the student timed out (went over the time limit for answering a question) during the last session. The bottom line shows the time-out value in seconds.

COM percentage of the course completed

TIME total time spent working on the course

STUDENT student number

Strand A - Principal Parts of Verbs

Strand B - Verb Usage

Strand C - Subject-Verb Agreement

Strand D - Pronoun Usage

Strand E - Possessives, Contractions, and Negatives

Strand F - Modifiers

Strand G - Sentence Structure

Strand H - Mechanics

Strand T - Lessons

ADULT READING SKILLS

The Adult Reading Skills course teaches reading skills equivalent to those expected of students who have successfully completed elementary school. The material in the course is grouped into five areas, or strands:

Strand A - Word Attack
Strand B - Vocabulary Study
Strand C - Literal Comprehension
Strand D - Interpretive Comprehension
Strand E - Work-Study Skills

A strand consists of a sequence of items arranged in order of increasing difficulty.

Strand A develops word-attack skills through structural analysis. It includes prefixes, suffixes, root words, compound words, and contractions.

Strand B builds a basic reading vocabulary. It includes specific vocabulary words, common synonym and antonym pairs, and sets of homonyms.

Strand C develops the student's ability to associate literal meaning with printed material. It includes transforms (transformational techniques that familiarize the student with the variety of ways simple sentences can be restructured and combined to form more complicated sentences), category recognition, and literal interpretation of short passages through questions and answers.

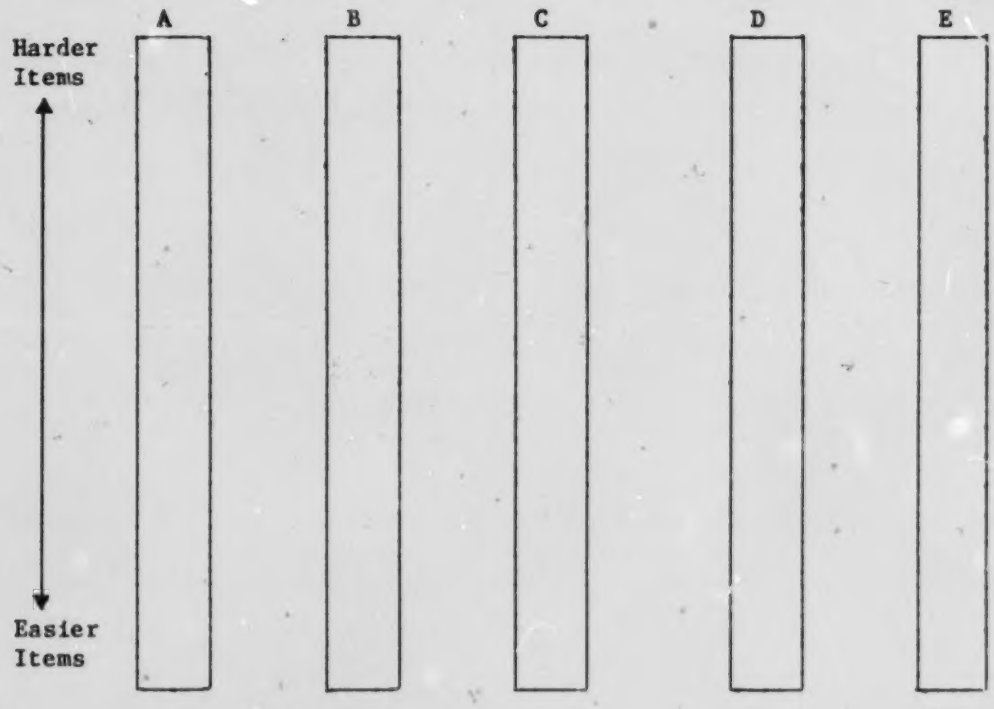
Strand D develops the student's ability to draw inferences and conclusions from written material. It trains the student to distinguish between fact and opinion and to recognize slanted, deceptive, or vague statements.

Strand E develops the skills necessary for finding specific information in a variety of resource materials. It also provides practice in alphabetizing.

The course begins with single-sentence items and builds to five-line paragraphs accompanied by sets of questions in Strands C and D. Although written on an elementary level, the subject matter is oriented towards young adults. Substantial portions of the curriculum introduce vocabulary required for consumer education, and many of the items deal with matters of consumer education and judgment.

The student receives items from all the strands in random order during one session. His progress through each strand, however, is independent of his work in the other strands or of any other student's work. He finds his own level in the course and moves on from that level at a rate determined by his ability.

STRANDS



STRAND A - Word Attack

Suffixes, Prefixes, Root Words, Compounds, Contractions

STRAND B - Vocabulary

Vocabulary Study, Homonyms, Synonyms, Antonyms

STRAND C - Literal Comprehension

Categories, Transformations, Questions and Answers

STRAND D - Interpretive Comprehension

Fact and Opinion, Primary Inference, Character Study, Analogies, Slanted Writing, More Interesting Writing, Metaphor and Simile

STRAND E - Work-Study Skills

Alphabetizing, Guide Words and Letters, Finding Information

SAMPLE LESSON

ADULT READING SKILLS

THIS BEAUTIFUL RANGE WILL MAKE COOKING FUN. (Strand D)

THIS IS ----.

1. AN OPINION 2. A FACT

THE CLERK MADE A MISTAKE AND GAVE ME TOO MUCH CHANGE. (Strand B)

THE CLERK MADE AN ----.

ERROR ERASURE OCTAGON

THERE IS NO USE FOR A BROKEN RECORD. (Strand A)

A BROKEN RECORD IS ----.

CORDLESS PAINLESS USELESS

(Strand E)

TO FIND OUT WHAT CONGRESS DID LAST WEEK, YOU WOULD LOOK IN ----.

1. AN ENCYCLOPEDIA 2. A DICTIONARY 3. A MAGAZINE

THERE ARE NOT GENUINE FLOWERS. THEY ARE MADE OF PLASTIC. (Strand B)

"GENUINE" MEANS ----.

WORTHLESS GOLDEN REAL

The following paragraph is from the last half of Strand C. It and its questions are presented as a unit.

****

JOYCE NEEDED TO BORROW $100. SHE WENT TO THE HAPPY LOAN COMPANY. THEY TOLD HER SHE WOULD HAVE TO MAKE 12 MONTHLY PAYMENTS OF $20. THEN SHE WENT TO A BANK. THEY TOLD HER SHE WOULD HAVE TO MAKE 6 MONTHLY PAYMENTS OF $20. JOYCE DECIDED TO BORROW THE MONEY FROM THE BANK.

*****

WHO NEEDED TO BORROW $100?

1. THE BANK 2. THE LOAN COMPANY 3. JOYCE

THE HAPPY LOAN COMPANY WANTED ---- MONTHLY PAYMENTS.

TWELVE SIX TWENTY

HOW MANY PAYMENTS DID THE BANK WANT?

SIX TWELVE FOURTEEN

HOW MUCH WERE THE BANK'S MONTHLY PAYMENTS?

1. $20 2. $6 3. $100

WHOM DID JOYCE BORROW THE MONEY FROM?

1. 12 PAYMENTS 2. THE LOAN COMPANY 3. THE BANK

The following paragraph is from the last half of Strand D. It and its questions are presented as a unit.

****

TIRED? NERVOUS? TRY ONE OF DR. QUACK'S HEADS UP PILLS. HEADS UP WORKS FAST. GOES RIGHT TO YOUR HEAD TO DISSOLVE ALL THOSE LITTLE

WORRIES THAT MAKE YOU TENSE AND UPSET. ENJOY LIFE. ONE LITTLE PILL CAN MAKE ALL THE DIFFERENCE. EIGHT OUT OF TEN DOCTORS INTERVIEWED RECOMMENDED HEADS UP. WHY DON'T YOU GET YOUR HEAD UP AND LIVE A LITTLE?

*****

IT IS ---- THAT YOU WILL ENJOY LIFE IF YOU TAKE ONE OF DR. QUACK'S PILLS.

1. A FACT 2. AN OPINION

THIS AD SEEMS TO SAY THAT A HEADS UP WILL ----.

1. MAKE YOU FEEL A LITTLE BETTER 2. MAKE ALL YOUR TROUBLES GO AWAY

WHICH IS TRUE?

1. EIGHT OUT OF EVERY TEN DOCTORS RECOMMEND HEADS UP.
2. EIGHT OUT OF TEN DOCTORS CHOSEN BY THE HEADS UP COMPANY RECOMMEND HEADS UP.

THE AD PROBABLY MAKES HEADS UP SOUND ---- THAN IT IS.

BETTER WORSE

HOW TO READ THE ADULT READING SKILLS PROGRESS REPORT

The Adult Reading Skills progress report looks like this:

ST	A	B	C	D	E	LST	TO	COM	TIME	STUDENT
CL	117	132	360	225	72	25	0	71	5:20	1
%	65	55	100	75	60	86	60			

ST stands for strand (area). This course has 5 strands, A, B, C, D, and E.

CL stands for class (group of 5 questions). The class number shows how many classes have been completed in each strand.

% the percentage of each strand completed

LST The top number shows the number of questions answered during the last session. The bottom number shows the percentage answered correctly.

TO The top number shows how many times the student timed out (went over the time limit for answering a question) during the last session. The bottom line shows the time-out value in seconds.

COM percentage of the course completed

TIME total time spent working on the course

STUDENT student number

Strand A - Word Attack

Strand B - Vocabulary

Strand C - Literal Comprehension

Strand D - Interpretive Comprehension

Strand E - Work-Study Skills

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THE GED CURRICULUM

The GED curriculum has seven parts:

Introductory Lessons
GED English
GED Social Science
GED Natural Science
GED Literature
GED Mathematics
Preparatory Lesson

Introductory Lessons

There are two introductory lessons. The first lesson explains how to use the terminal. The second lesson shows how to answer questions in the GED course.

GED English

GED English has 92 lessons organized into 24 topics. Ten short topics contain lessons on common spelling problems. Twelve longer topics cover diction, grammar, usage, and punctuation problems. The other two topics, the Midterm and the Final, are samples of the question types found on the GED examination. A glossary in the GED textbook contains definitions and examples of all the terms used in the course.

GED Social Science

GED Social Science has 50 lessons. Each lesson is a set of questions based on a reading selection, graph, or chart. The selections include topics on political science, history, economics, geography,

government, current affairs, sociology, anthropology, and study skills. The lessons train students to read, interpret, and analyze prose from the field of social studies. Understanding and interpreting graphs and charts is also stressed.

GED Natural Science

GED Natural Science has 50 lessons. Each lesson is a set of questions based on a reading selection. The reading selections include topics from the fields of astronomy, biology, health and safety, chemistry, earth science, and physics. The lessons train students to read, interpret, and analyze prose about scientific subjects.

GED Literature

GED Literature has 60 lessons. Each lesson is a set of questions based on a reading selection. The selections are taken from literary essays, plays, poems, short stories, and novels. The lessons train students to read, interpret, and analyze literary selections. A glossary of literary terms is included.

GED Mathematics

GED Mathematics has 50 lessons. The first 30 lessons teach the skills needed to solve typical problems. These lessons are based on topics in the GED textbook. The last 20 lessons are sets of problems like those found on the GED examination.

Preparatory Lesson

The last lesson in the GED curriculum is the preparatory lesson. It prepares students for the actual GED test. It explains good test-taking strategy and describes the answer sheets used on the examination.

GED NATURAL SCIENCE SAMPLE LESSON

This excerpt from a GED Natural Science lesson shows questions answers, and error messages. Student responses are underlined.

*****

Blood consists of red blood cells, white blood cells, and blood platelets, all suspended in a fluid called plasma. Ninety percent of the plasma is water. Plasma also contains salts and various blood proteins which play important roles in blood clotting, water balance, and immunity against disease. Making up the remainder of the plasma are substances that travel from one part of the body to another through the circulatory system. These substances include hormones, digested food, dissolved gases, and waste products.

*****

THE MOST ABUNDANT SUBSTANCE IN BLOOD PLASMA IS

1) SALTS

2) BLOOD PROTEINS

3) DIGESTED FOOD

4) WATER

4

*

WHICH OF THE FOLLOWING IS NOT AN ACTIVITY CARRIED OUT BY THE BLOOD?

1) CLOTTING

2) TRANSMITTING INHERITED DEFECTS

3) CARRYING FOOD FROM DIGESTIVE ORGANS TO OTHER PARTS OF THE BODY

4) TRANSPORTING HORMONES FROM ONE PART OF THE BODY TO ANOTHER

4

////

THE PARAGRAPH SAYS HORMONES TRAVEL THROUGH THE BLOODSTREAM.

TRY AGAIN.

2

*

THE SUBJECT OF THIS PARAGRAPH IS

1) THE ROLE OF BLOOD IN PROTECTING AGAINST DISEASE

2) THE CIRCULATORY SYSTEM

3) THE COMPOSITION OF HUMAN BLOOD

4) TYPES OF BLOOD PROTEINS

2

////

THE CIRCULATORY SYSTEM INCLUDES THE HEART AND BLOOD VESSELS. THESE ARE NOT DISCUSSED IN THIS PARAGRAPH.

TRY AGAIN.

3

*

Movement through the Curriculum

Adults vary widely in their ability to tolerate a rigid study plan. Furthermore, some of them may not need to take all the lessons in every course. For these reasons, the options for movement through the curriculum and through each course have been kept as flexible as possible.

The student may go through the GED courses in any order he wishes. He may move through the curriculum by taking a lesson from one course, a lesson from a second course, another lesson from a third course, the next lesson from the second course, and so on. He may change from one course to another at any time. He may also go completely through one course before taking any other course.

Movement through a Course

The student may go through a course by taking the lessons within it consecutively. He may also take them in a non-sequential order. For instance, he may repeat a lesson as many times as he wishes. Students sometimes repeat lessons either for review or as a means of improving their grasp of difficult concepts or techniques. The student may also wish to skip certain lessons or jump ahead to more difficult material. If he does not request a change of lessons, he will receive the lessons in the order in which they appear in the course.

GED SOCIAL SCIENCE
GED NATURAL SCIENCE
GED LITERATURE

Three parts of the GED examination are essentially reading tests. These tests and the GED curriculum courses that correspond to them are:

Test	Course
Test 2: Interpretation of Reading Materials in the Social Studies	GED Social Science
Test 3: Interpretation of Reading Materials in the Natural Sciences	GED Natural Science
Test 4: Interpretation of Literary Materials	GED Literature

The GED reading tests probe the applicant's ability to understand and interpret specialized reading material. To complete them successfully, the applicant must exercise the following specific reading skills:

Reading for the main idea
Reading for details
Deriving word meanings from contextual clues
Drawing conclusions and inferences
Forecasting results
Determining attitudes
Identifying purpose
Determining tone

GED Social Science, GED Natural Science, and GED Literature are designed to develop these reading skills. The courses are similar in size, structure, and purpose. Each course contains 500 questions that refer to reading selections in the GED textbook.

GED ENGLISH

GED English familiarizes the student with a variety of concepts needed to pass the English portion of the GED exam. It includes spelling as well as common grammar, usage, punctuation, and diction problems. Some of its lessons refer to a glossary of English rules and principles, but none of the lessons refers to a reading selection.

GED English has a more complex structure than any other course in the GED curriculum. It possesses a definite sequence of topics with well-defined review paths and progress checkpoints. In addition, it has the same flexible options for student control as do the other courses.

GED English is also larger than the other courses. It has 1,200 questions in contrast to the 500 each other course contains. However, because GED English does not refer to reading selections, the student can finish it in approximately the same length of time he can finish any other course.

This course has a more complex structure than the other courses because it must teach many separate, specific concepts. A large number of questions is necessary to cover the subject and to provide adequate drill and review in all concepts.

GED MATHEMATICS

The GED Mathematics course is divided into two halves. The first half contains instructional material arranged in thirty topics (lessons) distributed among the following seven areas:

Area	Number of Topics
Arithmetic*	5
Fractions	5
Decimals	6
Percent	7
Algebra†	3
Geometry	2
Measurement	2

Subject Areas in GED Mathematics

* "Arithmetic" includes place value, rounding integers, and signed numbers.

† "Algebra" includes algebraic and numerical expressions.

The second half of the course consists of a set of approximately 200 multiple choice problems, presented in a format similar to that used on the GED exam. Most of the problems can be identified as belonging to one of the thirty topics presented in the first half of the course, but they occur in random order. Thus the problems in the second half of the course are not graded according to difficulty level or separated into topics. The student works through the entire set of problems.

THE GED PROGRESS REPORT

The GED progress report looks like this:

+246 CAROLYN STAUFFER

COURSE	LESSONS	TIME	PROBLEMS	% CORRECT	CURRENT LESSON
ENG	92	:24	20	75	13
SOC	50	12:20	31	70	16
NAT	50	6:37	18	83	37
LIT	60	4:46	29	59	12
MATH	50	2:14	10	80	6

+	A plus beside the ID number shows that the student took lessons on the day of the report.
COURSE	the courses in the GED curriculum
LESSONS	total number of lessons in the course
TIME	total hours and minutes
PROBLEMS	number of questions answered in the last session
% CORRECT	the percentage of questions the student answered correctly during the last session
CURRENT LESSON	the number of the lesson the computer will start on when the student has another session

Table 1

Distribution of Scores on the Vocabulary Section of the California Reading Test for Students Entering NTID in the Summer of 1974. (N = 236, Mean = 32.5, Standard Deviation = 10.5)

Raw Score	Frequency NTID - 74	Percentage NTID - 74	Percentile NTID - 74	Percentile 8th Grade*
2	1	0	1	1
5	1	0	1	1
10	2	1	1	1
11	1	0	2	1
12	1	0	2	1
13	1	0	3	1
14	1	0	3	1
15	2	1	4	1
16	4	2	5	1
17	4	2	7	1
18	4	2	8	2
19	4	2	10	2
20	6	3	12	3
21	1	0	14	3
22	6	3	15	4
23	5	2	18	4
24	6	3	20	5
25	10	4	23	7
26	6	3	27	8
27	10	4	30	10
28	5	2	33	12
29	14	6	37	12
30	8	3	42	14
31	12	5	46	16
32	10	4	51	18
33	6	3	54	21
34	5	2	57	24
35	8	3	59	27
36	11	5	63	31
37	13	6	68	34
38	7	3	73	34
39	5	2	75	38
40	8	3	78	42
41	4	2	81	46
42	3	1	82	50
43	4	2	83	54
44	3	1	85	58
45	5	2	87	62
46	3	1	88	66
47	6	3	90	69
48	3	1	92	73
49	1	0	93	76
50	3	1	94	79
51	2	1	95	82
52	3	1	96	84
53	3	1	97	86
54	1	0	98	86
55	1	0	99	90
56	1	0	99	93
58	1	0	99	97
60	1	0	99	99

*From Manual for California Reading Test, p. 52.

Table 2

Distribution of Scores on the Comprehension Section of the California Reading Test for Students Entering NTID in the Summer of 1974. (N = 236, Mean = 49.6, Standard Deveiation = 10.7)

Raw Score	Frequency NTID - 74	Percentage NTID - 74	Percentile NTID - 74	Percentile 8th Grade*
23	1	0	1	3
27	1	0	1	4
28	1	0	1	5
29	1	0	1	5
30	1	0	2	2
31	3	1	3	8
32	1	0	4	8
33	4	2	5	10
34	2	1	6	12
35	5	2	7	12
36	6	3	10	14
37	6	3	12	16
38	6	3	15	16
39	6	3	17	18
40	3	1	19	21
41	8	3	22	21
42	11	5	26	24
43	6	3	29	27
44	9	4	32	27
45	7	3	36	31
46	9	4	39	31
47	4	2	42	34
48	8	3	44	38
49	9	4	48	38
50	9	4	52	42
51	11	5	56	46
52	8	3	60	46
53	10	4	64	53
54	11	5	68	54
55	6	3	72	54
56	8	3	75	58
57	5	2	78	62
58	6	3	80	[illegible]
59	4	2	82	66
60	4	2	84	64
61	3	1	85	69
62	6	2	87	73
63	1	0	89	76
64	3	1	89	79
65	3	1	90	79
66	4	2	92	82
67	3	1	93	84
68	1	0	94	84
69	1	0	95	86
70	3	1	96	88
71	2	1	97	90
73	3	1	98	90
75	2	1	99	93
78	2	1	99	96

*From Manual for California Reading Test, p. 52.

Table 3

Percentile Equivalents of the Comparative Guidance and Placement Program Sentence Test for Students Entering NTID in 1974 when compared with a normative group of NTID Students and a Normative Group of Hearing Students. (N = 234, Mean = 35.8, Standard Deviation = 8.1)

Raw Score	Frequency NTID - 74	Percentage NTID - 74	Percentile NTID - 74	Percentile NTID Total*	Percentile Hearing**
20	3	0	1	1	1
21	1	0	1	1	1
22	1	0	2	1	1
23	1	0	2	1	1
25	6	3	4	1	1
26	11	5	7	2	1
28	12	5	12	4	1
29	19	8	19	5	1
31	16	7	26	10	3
32	26	11	36	15	3
33	22	9	45	20	3
35	20	8	54	24	10
36	19	8	63	29	10
38	16	7	70	46	10
39	10	4	75	56	10
41	8	3	79	61	23
42	8	3	83	64	23
43	8	3	86	69	23
45	2	1	88	79	38
46	3	1	89	82	38
48	3	1	90	85	38
49	4	2	92	86	38
51	1	0	93	90	54
52	1	0	93	91	54
53	4	2	94	91	54
55	2	1	96	93	75
56	3	1	97	94	75
58	3	1	98	96	75
61	1	0	99	98	87
63	1	0	99	98	87
68	1	0	99	99	95

*Norms based on 507 students tested upon entering NTID between 1970 and 1973.
**Norms based on 13370 students entering vocational-technical institute nationally - 1972 Edition of CGPP.

Table 4

Summary of Scores for Students Entering NTID in 1974 on the NTID Written Language Test. (N = 265)

	Score*	Characteristics	% of Students
Poor English	1	(Unintelligible English)	.4
	2	(Word ordering and major constitutent omissions)	14.3
	3	(Semantic word choice errors)	55.1
	4	(Bound morphological, article, "and" series errors)	21.9
Good English	5	(Acceptable English)	8.3

*See Table 14 for a summary of the rules for arriving at a score.

Table 5

Comparison of the Experimental and Control Groups on Selected Variables Measured at Entrance.

	EXPERIMENTAL		CONTROL		
	$\bar{X}_E$	SD_E	$\bar{X}_O$	SD_O	t
Speech Intelligibility	3.00	1.38	2.[illegible]	1.29	.07
Pure Tone Average	91.65	13.83	91.06	11.87	.26
Discrimination	24.51	31.84	20.66	30.06	.62
LR Without Sound	33.26	17.76	33.76	17.16	-.14
Man Reception	45.84	30.43	55.75	29.63	-1.04
CGPP Reading	34.29	7.42	32.12	6.10	1.59
CGPP Sentence	34.51	0.66	32.86	5.36	1.14
NTID Written Language	3.54	.40	3.52	.58	-.66
Cal. Vocabulary.	6.66	1.26	7.36	1.46	-2.60**
Cal. Reading	7.99	1.02	8.32	1.16	-1.49
Yr. 2000	30.41	10.76	29.68	7.83	.39

*$p < .05$
**$p < .01$

Table 6

Topical Areas Covered by the Computer Curriculum Corporation Program in Adult Language Skills and Adult Reading Skills.

Strand		Topic
LANGUAGE	A	Principal Parts of Verbs
	B	Verb Usage
	C	Subject-Verb Agreement
	D	Pronoun Usage
	E	Contraction, Possesive, Negatives
	F	Modifiers
	G	Sentence Structure
	H	Mechanics
	T	Topics (a special strovel that contain short lessons on the topics covered in the other strands).
READING	A	Word Attack
	B	Vocabulary Study
	C	Literal Comprehension
	D	Interpretive Comprehension
	E	Work-Study Skills

Table 7

Criteria for English Course Placement of Students at NTID

Course Level	Written Language	California Vocabulary	California Comprehensive
1	1.00-2.80	to 5.9	to 6.9
2	2.81-3.30	6.0-6.9	7.0-7.9
3	3.31-3.80	7.0-7.9	8.0-8.9
4	3.81-4.30	8.0-8.9	9.0-9.9
5	4.31-4.80	9.0-9.9	10.0-10.9
No English required	4.81-5.00	10.0-up	11.0-up

Table 8

Description of Course Levels for English at NTID (1975-76)*

Course Level	Substantive Content	Emphasis	Sample Linguistic Structures	Sample Sentences
1	American Culture	Sentence	NP+VP+NP NP+CopPh+NP Which / What +NP+VP+NP	John helps his father. He was a gentleman. What lion is growling?
2	Development of a Technological Society	Paragraph	NP+Tense+do+Neg+V+NP NP+VP+VP+conj.+NP NP+V+by+NP	He doesn't wash his hands. John love Mary Sue and Joan. They were bored by the movie.
3	Content Fundamental to Technology	Composition	NP+Tense+(M)+(have+en) (be+ing) +be+V+en NP+VP+IP+NP NP+CopPh+Det+most adj. +nominal	He will have been promoted. He likes to drink beer. He was the most important person.
4	Major Technological Area	Vocabulary and Text Style of Technology	NP NP+CopPh+adj+prep+NP model What+Tense+be / have +rest of VP Complex Sentences	The civil war was vital at that time. What has John learned? The little boy who fell off his bike ran home in tears.
5	Contemporary English Literature	Reading and Analysis of Prose Literature	All Structures of the English Language	Correct English

*Detailed descriptions of these courses can be obtained from Department of English, National Technical Institute for the Deaf, 1 Lomb Memorial Drive, Rochester, New York 14623.

Table 9

Number of Subjects in the Experimental and Control Group by English Level.

Course Level	Control N	Experimental N
1	5	6
2	21	18
3	11	11
4	10	10
5	2	3

Table 10

Comparison of two groups of deaf students on tests of reading vocabulary (California Reading Test) before, during and after an exposure to English Language Training.

Testing	Regular English Class N = 49			Computer Assisted Instruction N = 48			
	Mean	SD	Range	Mean	SD	Range	t
Summer	6.66	1.26	(5.00-10.20)	7.36	1.46	(5.00-10.40)	-2.60**
Fall	7.23	1.21	(5.00-10.40)	7.72	1.30	(5.00-10.40)	-1.93
Winter	7.35	1.33	(5.00-10.20)	7.84	1.50	(6.00-11.40)	-1.72
Difference	.69	1.23	(-1.70-3.90)	.46	1.01	(-2.70-2.40)	- .95
Paired t Summer with Winter	3.92**			3.16**			

* $p < .05$
** $p < .01$

Table 11

Comparison of two groups of deaf students on tests of reading comprehension (California Reading Test) before, during and after an exposure to English Language Training.

Testing	Regular English Class N = 49			Computer Assisted Instruction N = 48			
	Mean	SD	Range	Mean	SD	Range	t
Summer	7.99	1.02	(2.80-4.67)	8.32	1.16	(5.70-11.30)	-1.49
Fall	8.37	1.29	(5.70-11.80)	8.53	1.22	(5.80-10.80)	- .63
Winter	8.81	1.27	(5.80-12.00)	8.94	1.39	(6.00-11.40)	- .49
Difference	.82	1.08	(-1.30-4.10)	.62	.99	(-1.50-3.80)	- .95
Paired t Summer with Winter		5.31**			3.34**		

* $p < .05$
** $p < .01$

Table 12

Comparison of two groups of deaf students on comprehension of directly stated facts using the California Reading Test before, during and after on exposure to English Language Training.

Testing	Regular English Class N = 49			Computer Assisted Instruction N = 48			
	Mean	SD	Range	Mean	SD	Range	t
Summer	11.22	1.72	(6-16)	11.92	2.17	(8-16)	1.75
Fall	11.12	2.11	(7-14)	11.25	2.23	(5-15)	.30
Winter	11.86	2.30	(7-15)	11.65	3.01	(4-16)	- .38
Difference	.64	2.95	(-6-7)	- .27	2.40	(-7-4)	-2.91**
Paired t Summer & Winter		1.46			-.77		[1]

* $p < .05$
** $p < .01$

Table 13

Comparison of two groups of deaf students abilities to make inferences about printed material before, during and after on exposure to English Language Training.

Testing	Regular English Class N = 49			Computer Assisted Instruction N = 48			
	Mean	SD	Range	Mean	SD	Range	t
Summer	9.18	2.60	(4-16)	8.85	2.87	(2-13)	- .58
Fall	8.86	2.89	(4-15)	8.77	2.87	(4-15)	- .12
Winter	9.57	2.93	(3-16)	9.29	2.83	(4-14)	- .37
Difference	.39	2.80	(5-7)	.44	2.35	(-5-5)	- .08
Period to Summer vs. Winter		.97			1.59		

* $p < .05$
** $p < .01$

Table 14

Summary of Rules for Rating Written Compositions of Students at NTID.*

Rating	Rules
5	Sentences free of syntactical and semantical anomalies. Allowable errors include spelling, punctuation and sentences introduced by "and", "but" or "so" but containing complete clauses.
4	Sentences including bound morpheme, article, and/or phrase and clause series "and" errors. Examples of these are errors of -s as a plural or possessive marker, -ing as a progressive marker, and -ed as a past marker.
3	Sentences that contain word choice errors of substitution, omission and/or addition errors not included in higher ratings. For example: He wanted to move at the country. (Preposition substitution) He jumped the ocean. (Omission of preposition)
2	Sentences that contain word order errors, omission of contentive phrases, or two clauses of which one is unintelligible, i.e., He poison bottle drank. (Word order error) The robber hold up. (Omission of contentive phrase)
1	Sentences that cannot be classified in any of the above categories, and for which the intended meaning is indiscernable. The rater is unable to decipher clues as to what the sentence may mean without having seen the stimulus. i.e., Plant pollute city move. He was think the neck hung.

* A complete set of these rules is available through the Department of English, National Technical Institute for the Deaf, 1 Lomb Memorial Drive, Rochester, New York 14623.

Table 15

Comparison of two groups of deaf students when evaluated for Writing Skills before, during and after an exposure to English Language Training.

Testing	Regular English Class N = 49			Computer Assisted Instruction N = 48			
	Mean	SD	Range	Mean	SD	Range	t
Summer	3.59	.40	(2.70-4.50)	3.52	.58	(2.16-4.87)	.66
Fall	3.79	.44	(2.80-4.67)	3.73	.63	(2.15-4.78)	.53
Winter	3.71	.55	(2.44-4.67)	3.62	.53	(2.50-4.63)	.78
Difference	.12	.57	(-1.50-1.33)	.10	.52	(-1.07-1.01)	- .17
Period to Summer vs. Winter		1.50			1.39		

*p < .05
**p < .01

Table 16

Comparison of two groups of deaf students using the measure of Type Taken Ratio before, during and after an exposure to English Language Training.

Testing	Regular English Class N = 49			Computer Assisted Instruction N = 48			
	Mean	SD	Range	Mean	SD	Range	t
Summer	35.37	2.55	(30-41)	36.35	4.06	(27-45)	1.42
Fall	35.51	5.90	(29-42)	35.60	3.06	(29-44)	.09
Winter	32.73	3.94	(26-43)	34.52	4.27	(25-43)	2.13
Difference	- 2.65	3.75	(13-3)	-1.83	4.79	(-12-9)	-1.05

* $p < .05$
** $p < .01$

Table 17

Comparison of two groups of deaf students' Verb Phrase use before, during and after an exposure to English Language Training.

Testing	Regular English Class N = 49			Computer Assisted Instruction N = 48			
	Mean	SD	Range	Mean	SD	Range	t
Summer	1.86	.55	(1.0-4.0)	1.85	.68	(1.0-5.4)	.07
Fall	1.83	.67	(1.1-4.3)	1.89	.73	(1.0-3.3)	.01
Winter	1.64	.66	(1.0-4.3)	1.75	.53	(1.0-3.1)	.85
Difference	-.22	.46	(-1.1-1.1)	-.10	.82	(-3.0-3.1)	-2.12

* $p < .05$
** $p < .01$